

# SPACE-TIME FEM FOR THE VECTORIAL WAVE EQUATION UNDER CONSIDERATION OF OHMS LAW

JULIA I. M. HAUSER\*

## ABSTRACT

The vectorial wave equation for the electromagnetic potential can be used to describe electromagnetic problems and arises from Maxwell's equations. Let us consider this vectorial wave equation in a 2D+1D space-time setting and treat time as another dimension. We do not simplify the equation. We know that the corresponding variational formulations for the vectorial wave equation are uniquely solvable, see [1]. If we additionally apply Ohm's Law to the underlying electromagnetic problem, we see linear dependencies in the right hand side. For this kind of equation we can still formulate uniquely solvable space-time variational formulations.

In this talk we will take a look at the numerical challenges of this problem. In addition to a CFL condition, we will see other challenges as well. We take a look at what kind of finite elements we have to choose to incorporate the whole problem and how the meshing effects our results. In the end we will discuss these numerical results and possible solutions to the numerical challenges of the vectorial wave equation.

## REFERENCES

- [1] J.I.M. Hauser, S. Kurz, O. Steinbach, *A Space-Time Finite Element Method for Maxwell's Equations using the modified Hilbert transformation*, in preparation.

\* TU DRESDEN, IWR, JULIA.HAUSER@TU-DRESDEN.DE